

# PATENT ABSTRACTS OF JAPAN

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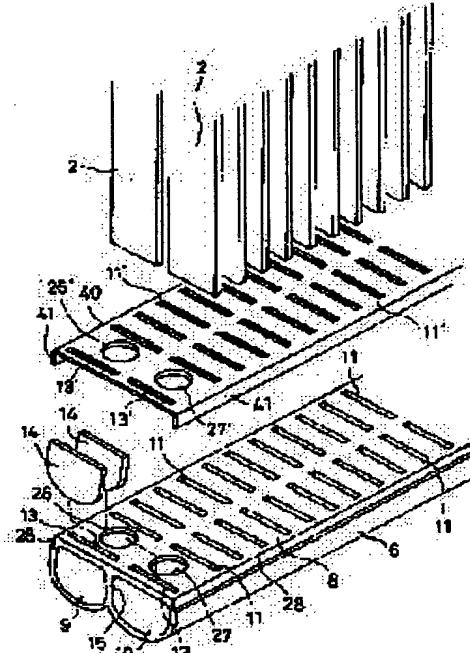
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#### (54) MANUFACTURE OF HEAT EXCHANGER

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a manufacturing method for a heat exchanger that makes sure the brazing of tubes and tanks as for the tanks manufactured by extrusion.

**SOLUTION:** The manufacturing method for the heat exchanger is as follows; a clad plate 40 having a brazing filler material layer(s) on both surfaces or on a single side is fixed on a surface 8 with the tube insertion holes of the tanks 6 which is manufactured by extrusion. The tubes 2 and the tanks 6 are brazed by the brazing filler material of the clad material 40 in a furnace.



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CLAIMS

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## [Claim(s)]

[Claim 1] In the heat exchanger which carried out the laminating of a tube and the fin by turns, and formed the tank in the end of a tube at least Said tank is formed of extrusion molding. To the tube insertion hole forming face side of this tank The manufacture approach of the heat exchanger characterized by arranging the clad plate which a wax material layer has on both sides or one side, and being fixed to said tank with a fixed means, for this clad plate being brazed by after an appropriate time among a furnace, and said tank and tube being brazed by the wax material of said clad plate.

[Claim 2] The manufacture approach of the heat exchanger according to claim 1 characterized by being the piece of bending of formation on one side or the both sides meeting the longitudinal direction of a clad plate as a fixed means.

[Claim 3] The manufacture approach of the heat exchanger according to claim 1 which it prepares in one side or the both sides meeting the longitudinal direction of Tanggu as a fixed means, is a piece of a \*\*\*\*\* presser foot, and is characterized by fixing a clad plate to a tank with caulking.

[Claim 4] The manufacture approach of the heat exchanger according to claim 1 characterized by carrying out the pressure welding of the clad plate to a tank with a press as a fixed means.

[Claim 5] It is the manufacture approach of the heat exchanger according to claim 1 characterized by that magnitude forming the clad plate side greatly although many tube insertion holes were formed in the tube and many tube insertion holes were formed in the same location as this tube insertion hole also at the clad plate.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Field of the Invention] Especially this invention relates to the heat exchanger which a refrigerant is poured and is used as an evaporator.

**[0002]**

[Description of the Prior Art] Conventionally the heat exchanger as an evaporator which manages a cooling operation By for example, the heat exchanger of a laminating mold as shown in JP,10-281685,A The shaping plate which comes by turns to carry out the laminating of the tube element and fin which are constituted by joining the shaping plate of a pair, and constitutes this tube element While wax material carries out press working of sheet metal (or spinning) of the aluminium alloy which uses as the main raw material the aluminum by which the clad was carried out to both sides, and is formed in them and the two arm-like bulge sections for tank formation are formed in the end section The bulge section for path formation which has the protruding line prolonged [ to / from the two bulge sections for tank formation / near the other end of a shaping plate ] following this is formed.

[0003] Bulge formation of the bulge section for tank formation is carried out more greatly than the bulge section 9 for path formation. Moreover, if two shaping plates are joined in the periphery, while the protruding line is formed so that it may become the same field as the junction cost of a shaping plate periphery, and the tank of a pair will be formed of the bulge section for tank formation which a mutual protruding line is also joined and counters The U character-like heat exchange medium path to which between tanks is connected by the bulge section for path formation which counters is formed.

[0004] Moreover, as shown in JP,9-159316,A, the laminating mold evaporator of another object is developed for the tank and the tube element. The tube element of this laminating mold evaporator opposes the metal plate of two sheets mutually, and a concave surface is combined in the shape of the midst, and is constituted, and the U character-like refrigerant path is formed in that interior. The a large number laminating of this tube element is carried out through a fin, and it is inserting that lower limit in the tank of a configuration of carrying out the following.

[0005] A tank inserts the lower limit of said tube element in two or more slit-like connection holes of formation to the top plate which is constituted combining a gutter-shaped top plate and a gutter-shaped bottom plate, and constitutes this tank, is brazed among a furnace and unified.

[0006] In recent years, small lightweight-ization with the much more heat exchanger is called for from the environmental problem etc. since the protrusion dimension of the bulge section of a tank be [ even about 5mm ] a limit and the pitch between tubes ( set to 1cm in this example) be naturally specify by limit of the height of this tank from the relation for which 0.5mm order be use for the thickness of a shaping plate in the laminating mold heat exchanger show in the previous well-known reference using the tube element of above-mentioned tank one apparatus, the design degree of freedom of a heat exchanger be small. Therefore, in order to reduce reduction of ventilation resistance, and a tube laminating number of stages and to raise productivity, the design technique of making the pitch between tubes large is impossible.

[0007] Moreover, in the heat exchanger show in next well-known reference, although a limit be

received about the pitch between tubes because the tank serve as a tube and another object, from on the relation from which this tank consist of two members, i.e., a top plate and a bottom plate, the water which advanced into a part for the joint of this top plate and a bottom plate destroyed a part for a joint by freezing, and the problem of refrigerant leakage had occur.

[0008] For this reason, the applicant did the laminating of a tube and the fin by turns, and in the heat exchanger of this tube which formed the tank in the end at least, while two or more paths were prepared so that said tank might be divided into an entrance-side path and an outlet side path, the tank which has two or more paths developed the heat exchanger fabricated in one.

[0009] Therefore, two or more paths established in a tank became independent, and the place into which the water of condensation advances since it is formed in one was lost, and it was lost that a tank carries out freeze fracturing. Moreover, since the tank was manufactured by extrusion molding, the tank could be manufactured easily.

[0010]

[Problem(s) to be Solved by the Invention] However, since extrusion molding of the tank is carried out and it does not have a wax material layer outside, a tube is inserted in a tube insertion hole, intervening a brazing sheet, and a tube and a tank are brazed. Since the aluminium alloy of A4000 system of silicon content is used, it is hard in quality of the material, and the adhesion at the time of making it stick to the tank by which extrusion molding was carried out with a press is bad, and a wax material sheet is a lifting and a cone in poor brazing. Moreover, since there was no fixed means with a tank, the workability at the time of core attachment was bad. Moreover, when bending of the wax material sheet was carried out, because of the hard quality of the material, the bending section breaks and processing could not be completed easily.

[0011] Then, this invention aims at offering the manufacture approach of a heat exchanger of having attained and had easy-ization of formation of a fixed means using the clad plate which formed the wax material layer of A4000 system in both sides or one side of a core material of A3000 system for the sheet as a means to supply wax material, instead of the wax material sheet of A4000 system, and having aimed at the improvement of the adhesion to a tank, and assemblability.

[0012]

[Means for Solving the Problem] In the heat exchanger which the manufacture approach of the heat exchanger concerning this invention carried out the laminating of a tube and the fin by turns, and formed the tank in the end of a tube at least Said tank is formed of extrusion molding. To the tube insertion hole forming face side of this tank It is in arranging the clad plate which a wax material layer has on both sides or one side, and being fixed to said tank with a fixed means, this clad plate being brazed by after an appropriate time among a furnace, and said tank and tube being brazed by the wax material of said clad plate (claim 1).

[0013] Thereby, wax material can fix the clad plate of formation on both sides or one side to a tank, and brazing with this tank and a tube becomes certain.

[0014] As a fixed means, it is the piece of bending of formation on one side or the both sides meeting the longitudinal direction of a clad plate, or is in the thing which was prepared in (claim 2), longitudinal direction one side of Tanggu, or both sides and which extrudes, are pieces or carries out the pressure welding of the clad plate with (claim 3) and a press (claim 4).

[0015] Furthermore, although many tube insertion holes are formed in a tube and many tube insertion holes are formed in the same location as this tube insertion hole also at a clad plate, it is in that magnitude having formed the clad plate side greatly (claim 5). Therefore, it has the advantage which make a tube easy to insert in the tube insertion hole of formation on a tank.

[0016]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained based on a drawing.

[0017] In drawing 1 thru/or drawing 3 , a heat exchanger 1 is a heat exchanger of a two pass, while carrying out the laminating of a tube 2 and the corrugated fin 3 by turns, arranges an end plate 4 on the both sides of the direction of a laminating, and is brazed that the vertical tanks 5 and 6 of another object seem to be open for free passage in each tube 2.

[0018] It is manufactured by roll-forming shaping, the cross section serves as a flat configuration, and a tube 2 looks at the plate of one sheet from a cross section, and consists of the radii section of a pair, and the bay of a pair, and one radii section is the joint of formation by the volume bundle.

[0019] While the downward tank 6 is equipped with the entrance-side path 9 and the outlet side path 10 which were prepared independently, many tube insertion holes 11 and 11 of a pair with which tubes 2 and 2 are inserted in the tube insertion hole forming face 8 of the one side of it are formed at equal intervals. And it is inserted in longitudinal direction both ends through the long holes 13 and 13 for the lock out plates 14 and 14 to blockade said each paths 9 and 10. In addition, the inlet-port pipe 17 and the outlet pipe 18 linked to a refrigerating cycle are connected to the entrance-side path 9 and the outlet side path 10, respectively.

[0020] The distributor 20 of formation of many free passage holes is allotted to a longitudinal direction in the interior, and said especially entrance-side path 9 is divided into the tube connecting path 21 and the inlet-port member connecting path 22 up and down, as shown in drawing 2. The inlet-port pipe 17 is connected through the spacer which the edge of a tube 2 is connected to said tube connecting path 21 through the tube insertion hole 11, and is not illustrated to said inlet-port member connecting path 22.

[0021] The inlet-port pipe 17 is inserted in the round hole 26 of the formation to the tank inside side 8, i.e., a tube insertion hole forming face, and is connected to said inlet-port member connecting path 22.

[0022] As said outlet side path 10 was described above, it is installed with the entrance-side path 9, and the outlet pipe 18 is connected. The connection between this outlet pipe 18 and the outlet side path 10 is inserted in the medial surface 8 of a tank 6, i.e., a tube insertion hole forming face, through the spacer which is not illustrated to the round hole 27 of formation, and is connected to the outlet side path 10. Although the wax material layer is not formed in both external surface since both these pipes 17 and 18 are pipes manufactured by extrusion molding, brazing has got used with the spacer which has a wax material layer in both sides.

[0023] The edge (anti-Tanggu edge) of that opposite side is bent by the anti-tubeside, and, as for the above mentioned inlet-port pipe 17 and the above mentioned outlet pipe 18, the expansion valve attachment joint 31 to attach an expansion valve in this bent part is attached. For the inlet-port pipe attachment slot 34 on another side, by forming the inlet-port pipe attachment slot 34 and the outlet side mounting hole 35 in the substrate of an ellipse, the tip of said outlet pipe 18 is joined, said inlet-port pipe 17 is inserted from an opening side, and that one side outlet side mounting hole 35 is [ this expansion valve attachment joint 31 ] caulking \*\*\*\* attachment eclipse \*\*\*\*\*. In addition, 38 is a \*\*\*\* hole. Thus, when the expansion valve attachment joint 31 is formed in a way side among the tanks 6 of a heat exchanger 1, since the entrance pipes 17 and 18 are bent by the anti-tubeside, they do not cause trouble to attachment of an expansion valve.

[0024] Extrusion molding of the aluminium alloy material of A3000 system is used and carried out, it is manufactured, with the gestalt of this operation, it had a septum 15 in the center, and the entrance-side path 9 and the outlet side path 10 which were described above right and left were formed in the above mentioned tank 6, it dissociated completely between both paths, and both the paths 9 and 10 have been independent on it. Since extrusion molding is carried out, the wax material layer is not given to both the external surface. Therefore, at the time of brazing [ with a tube 2 and a tank 6 ] among a furnace, a clad plate 40 is intervened and the wax is supplied.

[0025] That is, a clad plate 40 is what carried out the clad of the alloy (wax material) of A4000 system of silicon content on both sides or the external surface of an alloy of A3000 system as a core material, this clad plate 40 is a long and slender band-like thing, and the pieces 41 and 41 of bending used as a fixed means are formed in the both sides meeting that longitudinal direction. These pieces 41 and 41 of bending are inserted in the steps 28 and 28 of formation on both sides meeting the longitudinal direction of the above mentioned tank 6 in case the tube insertion hole forming face 8 is equipped with a clad plate 40.

[0026] Moreover, long hole 13' of a configuration, 13', a round hole 16, 17', much tube insertion

hole 11', and 11' are formed in the front face of this clad plate 40 like the same location as the long hole 13 of formation to the tube insertion hole forming face of the above mentioned tank 6, 13 round holes 26 and 27, and many tube insertion holes 11 and 11. These long hole 13', round hole 16', and tube insertion hole 11' are somewhat formed greatly rather than the long hole 13 of the above mentioned tank, the round hole 16, and the tube insertion hole 11. [0027] As shown in drawing 1, the edge of said tubes 2 and 2 is inserted, and the upper tank 5 carries out turning of the refrigerant which flows out of one tube 2, and is serving for the tube 2 of another side to make flow again. Although extrusion molding of the aluminium alloy material of this five Atank 3000 system is used and carried out and it is manufactured, the lock out plate 30 is inserted in the longitudinal direction both ends of that tank 5. The same clad plate 40 is intervened with having described above, although this tank 5 was not illustrated, either, and it is brazed among a furnace.

[0028] In an above-mentioned configuration, although a heat exchanger 1 inserts the vertical edge of a tube 2 in the tube insertion hole 11 of the upper tank 5 and the downward tank 6 after carrying out the laminating of a tube 2 and the fin 3 by turns, it equips the tube insertion hole forming face 8 of a tank 6 with the clad plate 40 as shown before that at drawing 2 like drawing 3. That is, the pieces 41 and 41 of bending of formation on the both sides accompany the longitudinal direction of a tank 6, and this clad plate 40 is inserted and fixed to the steps 28 and 28 of formation. For this reason, a clad plate 40 is stuck and attached in the tube insertion hole forming face 8 of a tank 6.

[0029] And a tube 12 is inserted into the tube insertion hole 11 of a tank 6 from tube insertion hole 11' of a clad plate 40. It is put in and heated all over a furnace after that, the wax material of adhesion on both sides or one side of a clad plate 40 melts and flows, and it is the thing which will sharpen and which is attached tank 6 with a tube 2. In addition, the upper tank 5 is the thing which will be taken and which is attached tube 2 similarly.

[0030] In drawing 4, the gestalt of implementation of the 2nd of this invention is shown, and a crevice 42 and heights 43 are formed between the piece 41 of bending of a clad plate 40, and the step 28 of a tank 6. Thereby, the degree of adhesion to the tank 6 of a clad plate 40 improves.

[0031] In drawing 5 and drawing 6, they are other examples which the gestalt of implementation of the 3rd of this invention is shown, and are fixed to a tank 6 in a clad plate 40 (adhesion). Unlike said example, this example was pressed down on both sides meeting the longitudinal direction of a tank 6, pieces 44 and 44 are formed, and as shown in caulking \*\*\*\*\* drawing 6 R> 6, a clad plate 40 can stick and attach these pieces 44 and 44 of a presser foot in the tube insertion hole forming face 8 of a tank 6.

[0032] In drawing 7 and drawing 8, the gestalt of implementation of the 4th of this invention is shown, it sticks and a clad plate 40 is attached, as a press 45 shows to the tube insertion hole forming face 6 of a tank 6 at drawing 8.

[0033] In addition, as shown by the gestalt of said the 1st and 3rd operation, only not only for both sides but one side, the piece of bending and the piece of a presser foot are.

[0034]

[Effect of the Invention] As mentioned above, according to this invention, in the heat exchanger manufactured using the tank of extrusion molding, using a clad plate, it can fix to a tank with a fixed means, and this clad plate sticks supply of wax material for a clad plate to a tank, it is used for the brazing and soldering of a tube and a tank, and positive brazing can do wax material.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** It is the perspective view of the heat exchanger manufactured by this invention.

**[Drawing 2]** It is the decomposition perspective view having shown the condition before a tube is attached to a tank in the important section of this invention.

**[Drawing 3]** It is the important section expansion side elevation of the heat exchanger manufactured by this invention.

**[Drawing 4]** It is the important section expansion side elevation showing the gestalt of implementation of the 2nd of this invention.

**[Drawing 5]** It is the explanatory view showing the gestalt of implementation of the 3rd of this invention.

**[Drawing 6]** It is a side elevation in the condition that the clad plate was fixed to the tank by the gestalt of the 3rd operation of the same as the above by caulking \*\*.

**[Drawing 7]** It is the explanatory view showing the gestalt of implementation of the 4th of this invention.

**[Drawing 8]** It is a side elevation in the condition that the clad plate was fixed to the tank by the gestalt of the 4th operation of the same as the above.

**[Description of Notations]**

1 Heat Exchanger

2 Tube

3 Fin

4 End Plate

5 Tank

6 Tank

8 Tube Insertion Hole Forming Face

9 Entrance-Side Path

10 Outlet Side Path

11 Tube Insertion Hole

17 Inlet-Port Pipe

18 Outlet Pipe

26 Round Hole

27 Round Hole

28 Step

40 Clad Plate

41 Piece of Bending

42 Crevice

43 Heights

44 Piece of Presser Foot

45 Press

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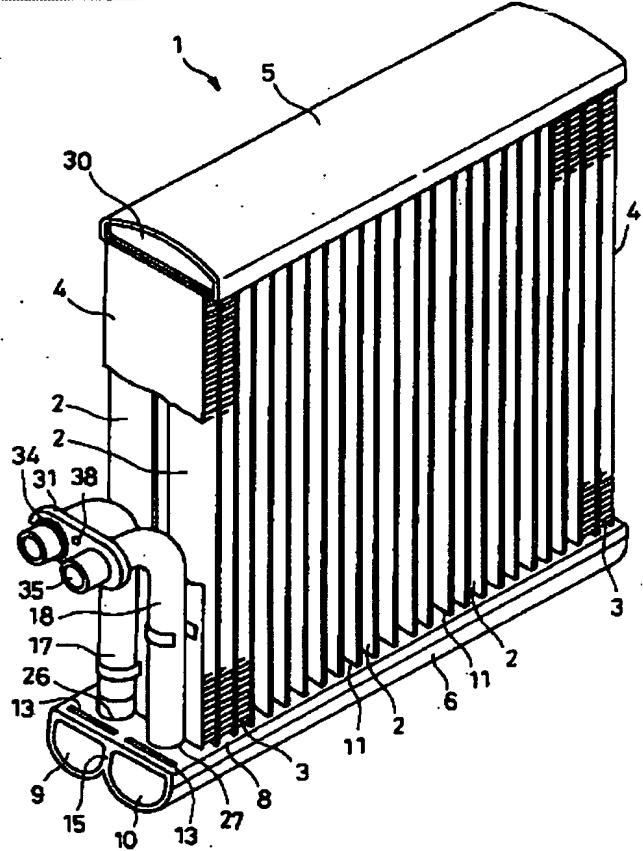
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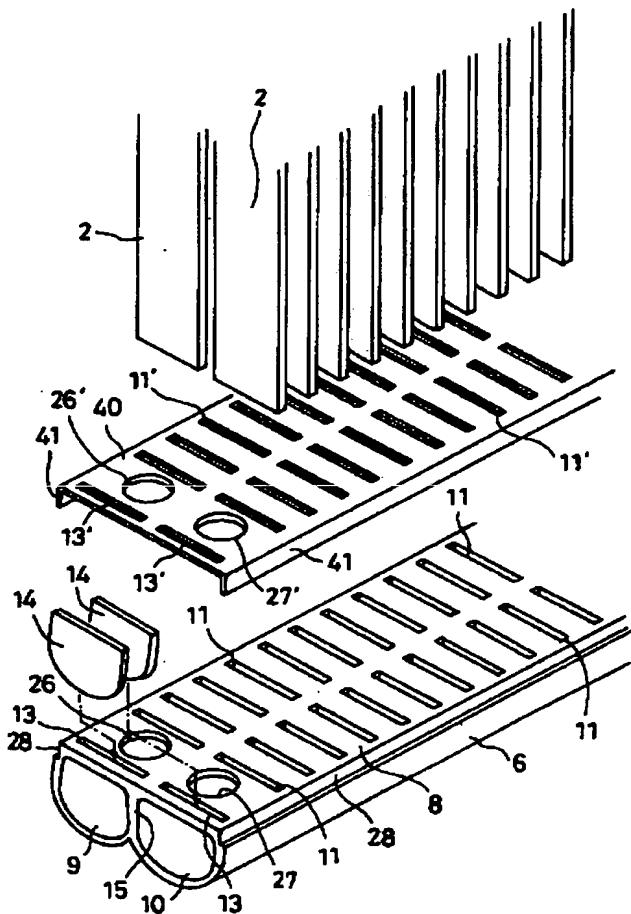
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## DRAWINGS

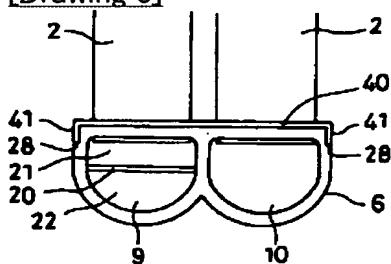
## [Drawing 1]



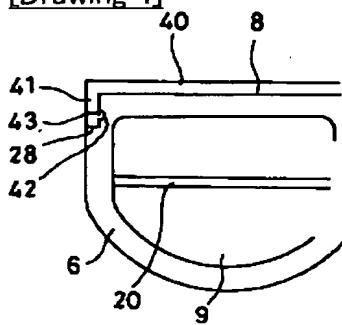
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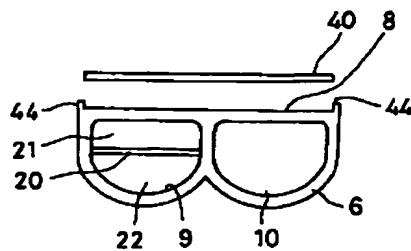
[Drawing 3]



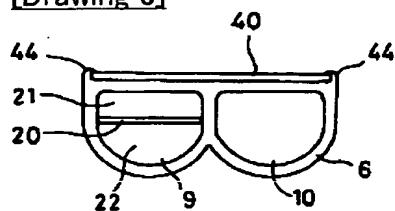
[Drawing 4]



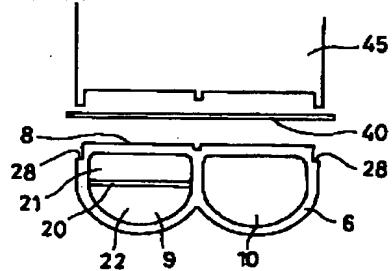
[Drawing 5]



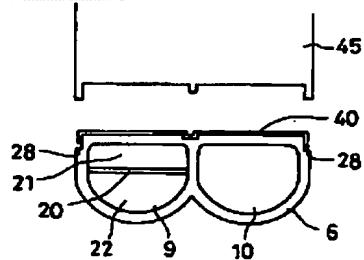
[Drawing 6]



[Drawing 7]



[Drawing 8]



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